

### Claims

1. A transmitter for outputting a transmitting signal while amplifying power of the transmitting signal, comprising:

a variable gain amplification means for amplifying an input modulated signal based on the transmitting signal and controlling the gain based on a control signal;

a power amplification means connected to the rear of the variable gain amplification means; and

a power amplification control means for controlling a supply voltage of the power amplification means on the basis of the control signal, wherein:

the power amplification means has a linear operating mode for amplifying power by using a linear operating region in input-output power characteristic of the power amplification means, and a saturation operating mode for amplifying power by using a saturation operating region in input-output power characteristic of the power amplification means;

the control signal includes an operating mode set signal for setting the operating mode of the power amplification means; and

the power amplification means operates in either operating mode on the basis of the operating mode set signal.

2. The transmitter according to Claim 1, wherein the modulated signal input to the power amplification means has a temporal change of an amplitude component.

3. The transmitter according to Claim 1 or 2, wherein the gain of the variable gain amplification means in the case where the power amplification means is operated in the saturation operating mode is controlled to be higher by a predetermined value than that in the case where the power amplification means is operated in the linear operating mode.

4. The transmitter according to any one of Claims 1 through 3, wherein the power amplification control means performs control so that the supply voltage is changed in accordance with instantaneous output power of the power amplification means in the saturation operating mode.

5. The transmitter according to any one of Claims 1 through 4, wherein the power amplification control means performs control so that a bias point set for the power amplification means is changed on the basis of the supply voltage input to the power amplification means.

6. The transmitter according to any one of Claims 1 through 5, further comprising an amplitude modulation variable gain amplification means for applying amplitude modulation to a phase-modulated signal obtained by modulation of a phase signal of the transmitting signal and outputting an amplitude-modulated signal, wherein the power amplification means amplifies power on the basis of the amplitude-modulated signal.

7. The transmitter according to Claim 6, wherein the amplitude modulation variable gain amplification means is provided in front of the variable gain amplification means.

8. The transmitter according to Claim 6 or 7, wherein the amplitude modulation applied to the phase-modulated signal by the amplitude modulation variable gain amplification means is performed on the basis of the supply voltage of the amplitude modulation variable gain amplification means.

9. The transmitter according to Claim 8, further comprising a limiter circuit provided in front of the amplitude modulation variable gain amplification means for converting a sinusoidal signal into a square signal.

10. The transmitter according to any one of Claims 1 through 5, further comprising a multiplier for multiplying the amplitude signal of the transmitting signal and the phase-modulated signal obtained by modulation of the phase signal of the transmitting signal to thereby apply amplitude modulation, wherein the power amplification means performs power amplification on the basis of the amplitude-modulated signal.

11. The transmitter according to Claim 10, wherein the multiplier is provided in front of the variable gain amplification means.

12. The transmitter according to any one of Claims 1 through 5, further comprising:

an amplitude/phase extraction means for receiving the transmitting signal as an input and extracting amplitude and phase components of the transmitting signal on the basis of in-phase and quadrature components of the transmitting signal; and

a phase modulation means for outputting a phase-modulated high-frequency signal on the basis of the phase component of the transmitting signal.

13. The transmitter according to any one of Claims 6

REPLACE by  
ART 19

through 11, further comprising:

an amplitude/phase extraction means for receiving the transmitting signal as an input and extracting amplitude and phase components of the transmitting signal on the basis of in-phase and quadrature components of the transmitting signal; and

a phase modulation means for outputting the phase-modulated high-frequency signal on the basis of the phase component of the transmitting signal.

14. The transmitter according to any one of Claims 1 through 5, further comprising a quadrature modulator for receiving the transmitting signal as an input, applying phase modulation and amplitude modulation to the transmitting signal and outputting the modulated transmitting signal to the variable gain amplification means.

15. A transmission output control method for controlling a transmission output, comprising the steps of:

amplifying an input modulated signal (variable gain amplification step);

amplifying power in a state in which an output generated by the variable gain amplification step is

REPLACE by  
ART 19

input to a power amplification means (power amplification step); and

controlling a supply voltage to the power amplification means and an input to the power amplification means to thereby control the operating mode of the power amplification means to switch the operating mode over between a linear operating mode for operating the power amplification means in a linear operating region in input-output power characteristic of the power amplification means and a saturation operating mode for operating the power amplification means in a saturation operating region in the input-output power characteristic.

15. A radio communication apparatus having a transmitter defined in any one of Claims 1 through 14.